Rural Lines

RURAL ELECTRIFICATION ADMINISTRATION • U. S. DEPARTMENT OF AGRICULTURE

MARCH 1959

THE RUPERT STORY

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LOAD FACTOR FACTS

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A Message from the ADMINISTRATOR

It looks like wholesale power contracts in the future are apt to be geared directly to a co-op's load factor. If that is the case, a co-op with a low load factor will have to pay considerably more for its power than a neighboring system with a high factor.

This prospect points up the need for urgent action now by co-ops in many areas to improve their load factors. There's no one answer, because load factor problems are varied. In some areas, there's still a sharp winter peak along about sundown. In others, a combination of air-conditioning and irrigation have pushed summer consumption up to a new high.

Carefully planned sales programs are one answer. Another is a concerted consumer education drive. A Pennsylvania co-op boosted its annual load factor from 41 to 60 percent in just 3 years by promoting two good round-the-clock, all-season items—water heaters and refrigerators. Other co-ops are boosting their load factors with security lights. In some areas, other appliances may be the answer.

One thing is sure—co-op members should be cut in. Any co-op with load factor troubles should put the problem on the agenda of the annual meeting. This will assure acceptance of sales promotion drives and consumer education. Furthermore, the member needs to understand load factor. It is the member's rates which are at stake.

David A. Hamil

Administrator.

Rural Lines

John H Howard, Editor. Contributors to this issue: W. W. Arnett, Jr.; Daniel E. Jones; Frank Wilkinson; Bernard Krug; Louisan Mamer.

Cover Picture: Donna Seidel uses new dial telephone.

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The Feeling is Mutual

Mrs. Graham, (left) Meadow River secretary-treasurer, acts as "subscriber" paying bill to Mrs. Mary Summerfield, bookkeeper.

Everybody in Rupert, W. Va., likes the telephone company. And the feeling is mutual.

The Meadow River Telephone Co., Inc., is an REA borrower in Greenbrier County, in the mountainous southeast part of the State.

"Our company has been providing telephone service here for over fifty years," says J. Rodney Graham, president and manager. His wife, Mary Hunt Graham, is secretary and treasurer. Her father, W. R. Hunt, was one of the founders and a charter member of the old Meadow Bluff Mutual Telephone Company. Back in those days subscribers had to buy a $25 share in the system and then pay 50 cents a month for service.

"That monthly rate was raised from 50¢ to $1 in 1919," Mrs. Graham said, "and some of the people who voted the increase are still on our lines."

Meadow River Telephone is located in a small town on Route 60 but there is nothing small about the progress of the company or the forward-looking aspects of its management. It is a live-wire organization, in every sense of the word.

Its new building is a case in point. It is a trim, sturdy-appearing structure on the corner of 6th street and Rupert's main thoroughfare. It is 40 x 77 feet, of cinder block and brick construction, with a pre-cast concrete roof supported by a steel superstructure.

"We've been in this new building since April 1958, when we cut over to dial," Graham stated. "Before that, we had rented quarters for more than 10 years and things got so cramped that we all felt as if we were working in a telephone booth."

All that is changed now. Everything is in its accustomed place and efficiency is the order of the day.

It wasn't too difficult to sell the subscribers on the merits of automatic dial service. Most of them had had telephone service for many years and signed up for the dial service, despite a small rate increase to help pay for the new and improved plant.

That cutover ceremony is a subject of a private joke between the Graham family and the construction firm that did the work.

"In 1954", Mrs. Graham reminisces, "when we received our first REA loan, we were serving about 330 stations. I told the workmen that we would probably double our service 18 months after the cutover. Actually, we doubled it about 18 days afterward."

Sam G. Wilson, plant superintendent, operates wire chief test set. This equipment indicates line trouble, and its approximate location.

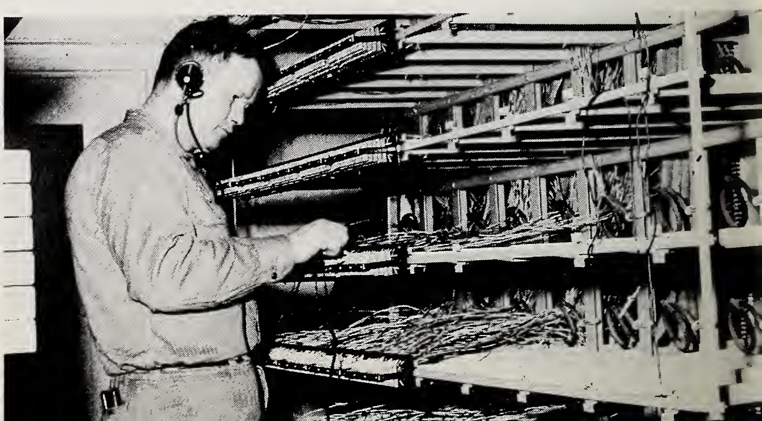
The company operates about 120 miles of line in a service area of approximately 20 square miles. It now has more than 700 stations and is rapidly approaching its "five year figure." There is still a backlog of 40 to 50 applications for service which the company is processing as fast as possible. An area coverage survey, recently completed, indicates that Meadow River's top potential is close to 1,600 stations.

The company now provides extended area service between Rupert and Rainelle, a somewhat larger community about 7 miles west on Route 60. Toll calls are handled by the Bell system at Lewisburg, 20 miles east of Rupert.

The Grahams took over management of Meadow River in 1954. It was like a homecoming for Mrs. Graham, because of her father's activity in operating the company's predecessor. The Grahams' son, Rodney, Jr., forsook the rural telephone field, however, and chose the ministry instead.

The staff at Meadow River is small, versatile and hardworking. In addition to Mr. and Mrs. Graham, there is Mrs. Mary Summerfield, bookkeeper; Sam G. Wilson, plant superintendent; Hayward Martin, lineman-installer; and Edward Shafer, clerk. Also, a commercial auditor comes in once a month to check the books, at billing time. Wilson was manager of another REA borrower, Hardy Telephone Company, at Mathis, West Virginia, before joining the Meadow River staff. Martin has been with the local company for a dozen years.

The company's position in the community is unique. The Grahams are proud of that position, and try to better it every chance

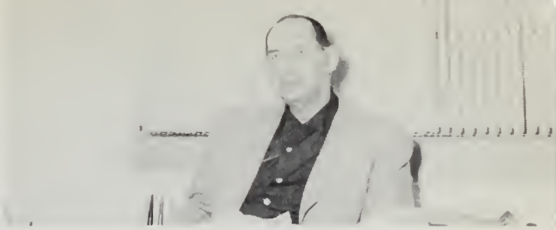


Hayward Martin, lineman-installer, tests connection on horizontal side of main distributing frame.

they get. For instance, when a Rupert high school class was assigned to write themes about local utility organizations, more than half the students chose the telephone company. There was a steady stream of students going through the plant, looking at the automatic equipment, asking question after question. "Some of them even let us see their themes after they were written," Mrs. Graham chuckles.

The Rupert-Rainelle area was rather hard hit by the business recession and only now is struggling to shake off the after-effects of that economic slump.

Farming in Greenbrier County is mostly part time, with major farm enterprises centered on the production of livestock and dairy products. Coal mining, however, is the most important activity in the local labor market and any shutdown or curtailment of mine operations results in drastic repercussions all along the line.



This is J. Rodney Graham, president and manager of Meadow River, at his desk in new building.

The Meadow River Telephone Company is doing its share in helping the community pull itself out of the downcurve. Much of the money spent for labor and materials for the new headquarters building was poured into the local economy. Too, the company always has been more than understanding about subscribers who are temporarily unable to meet their monthly bills.

Meadow River is doing an important job in this West Virginia community, providing vitally-needed communication facilities, with modern equipment, and at moderate cost to its subscribers.

Study Leads To Success

"Anyone planning a career in accounting or management with REA-financed telephone systems should take advantage of the REA Borrower Accounting Course", says Reynold C. Stenman of the James Valley Cooperative Telephone Company of Groton, S. Dak. Stenman was one of the first two students to finish the course. He finished in a dead heat with Vernon Inmon of the Santa Rosa Telephone Cooperative of Vernon, Tex.

Stenman

Inmon

Only a few days after completing the course, Stenman was chosen for the post of manager of the Midstate Telephone Company at Kimball, S. Dak.

Mr. Inmon reports that the course has been a tremendous help in solving the problems of the Texas cooperative.

Finishing third in the accounting course was Miss Joyce Bradshaw, bookkeeper for the Mebane Home Telephone Company, Inc., of Mebane, N. C.

Two-Pin Crossarms Here To Stay

"When REA's engineers first began to talk about two-pin crossarms," said Warren French, "I was probably less than enthusiastic. But their durability will result in considerable savings in maintenance costs. Literally, the two-pin crossarms are here to stay."

Warren B. French is manager of the Farmers Mutual Telephone System of Shenandoah County, of Edinburg, Va. The Shenandoah County System was designed to serve almost 5,000 subscribers on its 600 miles of line which run up and down the historic Valley of Virginia. Warren French's top-flight management reputation is backed up with an electrical engineering degree.

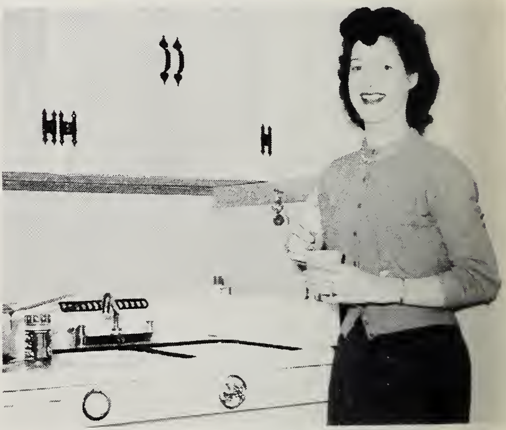
He didn't see anything wrong with the old-style brackets in use on the Shenandoah system. However, he went along with the REA recommendations on learning that the old brackets are not included in the Telephone System Construction Contract's largest edition, dated January 1959. Only the two-pin crossarms are in the new edition.

When French mentioned the greater durability of the crossarms, he referred to their salvageability and better wearing qualities. The two-pin crossarms are made of treated yellow pine or Douglas fir, whereas the old brackets were made of locust or white oak. The shorter-lived brackets are apt to warp and crack.

The crossarms are 18 inches long and 12 inches between pins. They are fastened to the pole with a throughbolt and a 60-penny nail, instead of the several nails required for a pair of brackets.

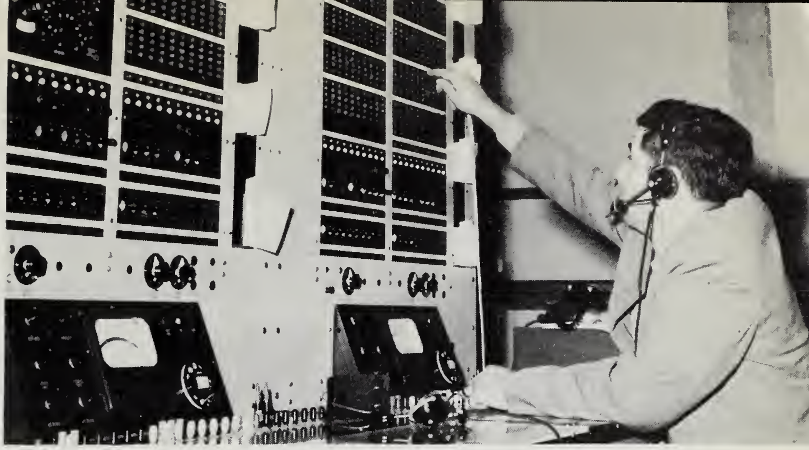
Labor costs on crossarms are a little less than for brackets, and the cost of the crossarm is also less, amounting to almost a dollar's difference between a crossarm and a pair of brackets when existing poles are to be used.

Farmers Mutual moved into its spanking new building in the heart of Edinburg last November. For the first time, there is a place for everything, for example, the six



Mrs. Helen Palmer, toll operator, takes time out for a quick cup of coffee in operator's lounge. Room is equipped with refrigerator, range, sink, dinette set.

Manager French checks lines on 2-position wire chief's test board.



toll operators now have a special lounge for themselves, complete with electric range, refrigerator and sink, where they can prepare their lunches and rest-period snacks.

The new toll-board is the pride of the staff. It is an eight-position job and can handle up to 1,000 toll calls a day. In peak periods, such as holidays and weekends, it can take as many as 1,500 a day.

One feature of the board the operators like is the new "key punch" system. Instead of dialing a number on the conventional dial mechanism, the operator simply punches a small button, similar to those found on adding machines. Time is saved, both for the operator and the telephone caller.

The toll-board is located upstairs in a bright, well-lit, and spacious room. Downstairs are the equipment room, manager's office and board room, employees' locker and shower room, and the training room.

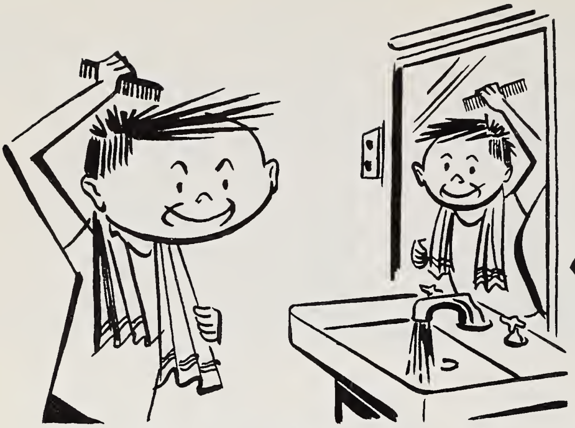
The latter room is used to orient new employees and to explain new technical procedures and programs to the present staff.

"We've been in operation under this same name for nearly half a century," French said, "and we are proud of the good relations we enjoy with our subscribers. We try to keep the 'honeymoon' going on as long as possible."

Farmers Mutual already has cut over three exchanges to dial operation. They are Edinburg, New Market and Mt. Jackson.

Three more cutovers were scheduled as of mid-January. Woodstock was slated for February 1, Toms Brook for March 1, and Strasburg for April 5.

Here's the new 8-position toll board, with operators Irene Jones, Harriet Funk and Gladys Holler, (left to right). Information directory is behind Chief Operator Funk. Punch keys on board speed up toll calls; dial is for local calls.



BUILDING THE LOAD WITH *Water*

By Daniel E. Jones, Power Use Advisor

When a farmer installs an automatic pressure water system, his electric consumption increases four times within a very short period. When you consider that the average water pump consumes so little power—only 20 to 30 kilowatt hours per month—this seems, at first glance, to be excessive. The many pieces of power-consuming, water-using equipment that the farmer adds later accounts for the large increase in power usage.

Items usually added are an electric water heater, an automatic electric clothes washer and a bathroom, with its large water consuming requirements. Frequently other appliances follow: an electric dish washer, garbage disposal, water lines to the poultry house, and livestock barns, and in the case of a dairy, an additional water heater in the milk house, watering cups in the dairy barn, and faucets for barn cleaning.

All this equipment means additional kilowatt hours.

While this additional load benefits the power supplier, the primary beneficiaries are the housewife, the farmer, and his family. A pressure water system eliminates arduous labor for the housewife and farmer, conserves valuable time, makes possible the operation of modern sanitary facilities and running hot water, promotes animal and crop growth, increases production, and improves quality of farm products. It raises the standard of living of the rural family.

Unfortunately, too many farm families have not been told the story of running water, effectively. They do not appreciate the importance of a water system and the advantages of an automatic pressure system. This fact is substantiated by the relatively low saturation of water systems on farms throughout the country. Less than 60 percent of farms with available electricity now have an automatic pressure water system.

Rapid improvement through intensive water system promotions by power suppliers is possible. In several states last year highly successful programs were conducted by statewide electric cooperative associations, generation and transmission cooperatives, and state farm electrification councils. States

with exceptionally successful programs included Arkansas, Wisconsin, North Dakota, Minnesota and Virginia.

In Arkansas during May, June, and July 1958, a series of meetings and demonstrations were held throughout local cooperative areas, coordinated by the Arkansas State Electric Cooperative. Among 11 cooperatives participating in the program there were 764 water systems sold and installed. In this program, as was also the case in the other States listed above, water system manufacturers, distributors, dealers, and well drillers joined with the power suppliers in a concerted effort to install the greatest possible number of water systems in farm homes.

In Wisconsin, The Dairyland Power Cooperative, at LaCrosse, coordinated a water systems promotion program among 19 of its member distribution cooperatives and three non-member distribution cooperatives adjacent to its operating area.

Cooperative managers, electrification advisors and other cooperative leaders met at LaCrosse during the winter to make promotion plans and to work with specialists from the National Association Domestic & Farm Pump Manufacturers, and specialists from REA, on ways to set up and conduct promotional programs.

Later, representatives of the local cooperatives, water system manufacturers, and REA met to plan a program for the individual cooperatives.

Various incentives were offered to encourage purchase and installation of water systems. Such incentives included: Water system essay

Well-digging rig attracts interest on "pump day."

contests in which substantial prizes were given the winners; cash contributions toward the installation of water systems; additional contributions for certain water-consuming equipment; convenient financing; and assistance in planning and designing adequate systems. The means employed to carry out the programs were varied. TV, radio, and newspaper publicity was widely employed. There were information meetings, field days and demonstration installations on farms, "open houses," and "pump days" among dealers. At these meetings and demonstrations the prospective purchasers could see the water systems and equipment, discuss their needs with specialists, and arrange for further assistance in planning and designing their indi-

Information about water can help sell water systems.

vidual systems. They learned the requirements as to pump capacities, pipe and pipe sizes, water sewage disposal, as well as cost of equipment and installation.

Members of the Price Electric Cooperative in Wisconsin (with less than 3,000 members) between March 1 and June 30 last year bought and installed 102 water systems and 77 water heaters. In addition, dealers obtained prospects for 92 more water systems and 11 water heaters. Other equipment sales by dealers attributed to increased store traffic as a result of this promotional effort included 15 automatic washers, 26 clothes dryers, 25 refrigerators, 21 ranges and 14 freezers.

Comparable results were obtained with similar promotions by borrowers in many areas.

For the year 1959, many statewide associations and farm electrification councils have planned concerted water system promotions. In many instances they are "kicking off" their programs with a three-day water system workshop being offered by the National Association Domestic & Farm Pump Manufacturers. These workshops will be conducted by highly qualified specialists from the home plants of various water system manufacturers. There will be instruction in the various types of pumps and their proper applications, water conditioning and water sources, as well as in organizing and conducting a water system promotion program.

Attendance at these workshops will include management and power use personnel of the electric cooperatives and power districts, Extension Service specialists, extension district agents and county agents, state health department specialists, vocational agriculture personnel, water system manufacturers, and, in the case of farm electrification council sponsorship, the farm specialists from the power companies.

The objective of the statewide water system workshop is to thoroughly train leaders associated with farm welfare and in the water system industry so that these leaders may in turn organize and conduct effective water system promotion programs at the local power supplier level. Water system dealers and well drillers are to be a distinct part of such local promotions.

All indications are that the year 1959 and succeeding years will be banner years for water system installations. There should be rapid increases in rural water systems, related water consuming appliances, and in kilowatt hour consumption.

Water systems for the 40 percent of farms which do not yet have them is only a portion of the water systems that will be installed in future years. An increasing number of farms now have two water systems. Many farms, too, will upgrade their present system by replacing small and obsolete pumps with modern systems of adequate capacities for present day usage.

For cooperatives, power districts and others who wish to conduct a water system program, there is a pamphlet "How to Organize and Conduct A Water System Promotion Program" available from REA.

Heating an Historic House

One hundred and forty years ago, Thomas Jefferson designed a 16-room Colonial house that was built on 500 acres of rolling countryside near Bowling Green, Va.

Hampton Manor is still standing today, as beautiful as ever, and even more comfortable and easy to live in because it is heated and cooled electrically by two 5-horsepower heat pumps. Electric power is furnished by the Virginia Electric Cooperative, with headquarters at Bowling Green.

The house has had an interesting history. Its first owner was aristocratic John Hampton de Jarnette, for whom the nearby village of de Jarnette was named. The present owner, M. R. Piland, a lumber company executive, purchased the estate shortly after World War II. Mrs. Piland is a direct descendant of John Hampton de Jarnette.

Back in 1941, Spanish surrealist Salvador Dali and his wife were house guests of Hampton Manor's owner, Mrs. Phelps Crosby. Restoration of the house had been completed just before the war. Dali devoted his time to bewildering the townspeople by such eccentricities as inviting a purebred Hereford bull into the stately dining room, or planting department store mannikins waist-deep in a frog pond that runs through the "back yard."

In early days, Hampton Manor was heated by an old-fashioned furnace in the center of the basement which sent blasts of hot air upward through a large vent in the floor of the front hall. In ad-

Underground cable starts here, long distance from house, to avoid stringing wires across front lawn.

Mrs. Piland points to one of the mansion's 5-horsepower heat pumps. That's an 80-gallon electric water heater on the left.

dition, every room had a fireplace.

When the Pilands acquired the estate, they began looking about for a more efficient method of heating the big house. In 1952, they settled on two five-horsepower heat pumps. The pumps operate all year round, cooling in summer and warming in winter. One pump handles the entire left hand side of the house plus the lower hall; the other takes care of the right side and the upstairs hall.

Each unit is completely automatic. When cooling is required, the pump extracts heat and moisture from indoor air in the same manner as a conventional air-conditioner. This heat is discharged to the outside air and the moisture is drained away.

When heating is needed, the pump automatically reverses its cycle of operation, extracting warmth from the outside air, and using it to heat the interior. Heat is extracted in much the same way as a refrigerator takes heat from its contents and discharges it into the kitchen.

The present "lord and lady" of Hampton Manor guard its appearance very carefully. For instance, when the heat pumps were installed, storm windows were placed on the inside of each window frame and are not visible from the outside. Also, they arranged with the electric cooperative to place the transformer and meter pole about two hundred yards to the side of the house, near the barn. Wiring was then run underground to the mansion, thus eliminating the need for stringing wires from the high-line across the lawn.

The big barn has an automatic stock watering tank for the herd of 75 Hereford cattle, which Piland markets every other spring.

The house's imposing facade belies the comfort and convenience inside. Oak beam construction, careful workmanship and thorough maintenance through the years have combined to make the structure thoroughly livable, despite its old age.

Heat comes to every room through small vents set low in the wall, except for the upstairs hall where the vent had to be placed in the center of the ceiling. Electrical conveniences are evident everywhere. There is a huge walk-in cooler in the basement, not far from the king-size commercial two-door food freezer. The big, old-fashioned kitchen is electrically modern in every respect, with refrigerator, food disposer, range, and dishwasher.

Although Hampton Manor has by far the most spectacular heat pump installation on the co-op's lines, it is not the only one. According to Co-op Manager W. R. Brown, nine other members have installed the pumps, including Mr. Brown himself.

The Browns recently added a room-and-bath annex to their comfortable eight-room frame home near Bowling Green. They are completely satisfied with the job their 3-horsepower heat pump is doing.

POWER USE EXCHANGE

PUMP DAYS

Over 60 members registered and 150 came and went during the 9-hour Pump Day show that climaxed the 100-day pump drive held last fall by Hancock-Wood Electric Cooperative, North Baltimore, Ohio. Members attending saw 20 displays with four working model pumps and asked questions of 10 experts on hand from noon to 9 p.m. on Pump Day. Added attractions included flowers for the ladies, cigars for the men, balloons for the children, and a drawing for a free submersible pump and an electric skillet. In its pump promotion, the co-op offered a $15 bonus for any first water pressure system installed by January 1, 1959. Midwest Electric, Inc., held a similar water system day in August at its offices in St. Marys, Ohio.

FREE WELL TESTS

Farm Service Adviser Charles Schultz spends part of his time each summer making free well tests for members of Warren Rural Electric Cooperative Corp., Bowling Green, Ky. Co-op owned equipment used by Schultz makes tests possible if the well is no more than 200 feet deep or 150 feet from the house. The co-op offers a $15 installation allowance to each member who installs electric equipment providing either hot or cold running water. The co-op pays $30 if both a water pump and an electric water heater are installed.

PUMP RATE

FEM Electric Association, Ipswich, S. Dak., offers members a pasture pump service on an advance payment plan, with a minimum $24 monthly billing for two poles. The cost of service is computed on an annual reading made on September 20 each year, with a minimum monthly billing of $2.

FREE HOOK-UP

From January to September, 92 members of Codington-Clark Electric Cooperative, Watertown, S. Dak., received free electric hook-ups of water heaters installed. This resulted in an average saving of $17.32, according to newsletter publicity. The only requirement for free installation was that the water heater must be an electric one and must be new load on the co-op's lines, though not necessarily a new appliance.

GO AUTOMATIC

During the winter, Adams Electrical Cooperative, Camp Point, Ill., offered a choice of small appliances to purchasers of modern automatic laundry equipment. One appliance was given with purchase of an automatic washer or dryer. Purchase of both units or of a combination washer-dryer gave members a choice of three of these: saucepan, skillet, mixer, drill, soldering gun, or blanket. Sales: 24 washers, 69 dryers, and 13 washer-dryers.

FILLING THE VALLEYS

IN YOUR SYSTEM LOAD CURVES

By W. W. Arnett, Consultant

At one time or another, practically every electric cooperative manager has done some wishful thinking about his power load. If only the consumers could be persuaded to distribute their use of electricity all around the clock instead of concentrating their use during the hours of peak load. If only this could be done, the co-op could supply twice as many kilowatt-hours without spending a single dollar to increase the system's capacity.

Expressed in engineering jargon, the manager's wishful thinking is contemplation of system load factor improvement. Load factor is defined as "the ratio of the average load over a designated period, to the peak load occurring in that period."

The load factor ratio is generally expressed in percent. The period is usually a year, a month or a day. For example, a rural system whose average load in kilowatts for a period of one month is one-half of its peak kilowatt load in the month has a 50 percent load factor for that month; an appliance with a constant load for 24 hours has a factor of 100 percent for that day.

The basic idea of load factor is not confined to electric service but has wide application in industry and on the farm. It expresses the benefits to be gained by maximum use of plant investment. For example, profits in the automobile industry depend on the extent to which its production lines are kept in continuous operation. On the farm, investment in a tractor or harvester may be either profitable or unprofitable depending on hours use of the implement.

The load curves illustrating this article are based on studies of "Diversity of Farm Loads" by Landy B. Altman, Jr., Agricultural Engineer, ARS, U. S. Department of Agriculture and Leon F. Charity, Assistant Professor, Agricultural Engineering, Iowa State College. The studies were made on Iowa farms served by rural electric distribution and power cooperatives.

Although the consumer's use of electric service is governed by his needs, there are a number of ways in which the consumer's use of service can be influenced by the power supplier. An increase of one percent in system annual load factor can result in a much greater increase in net income.

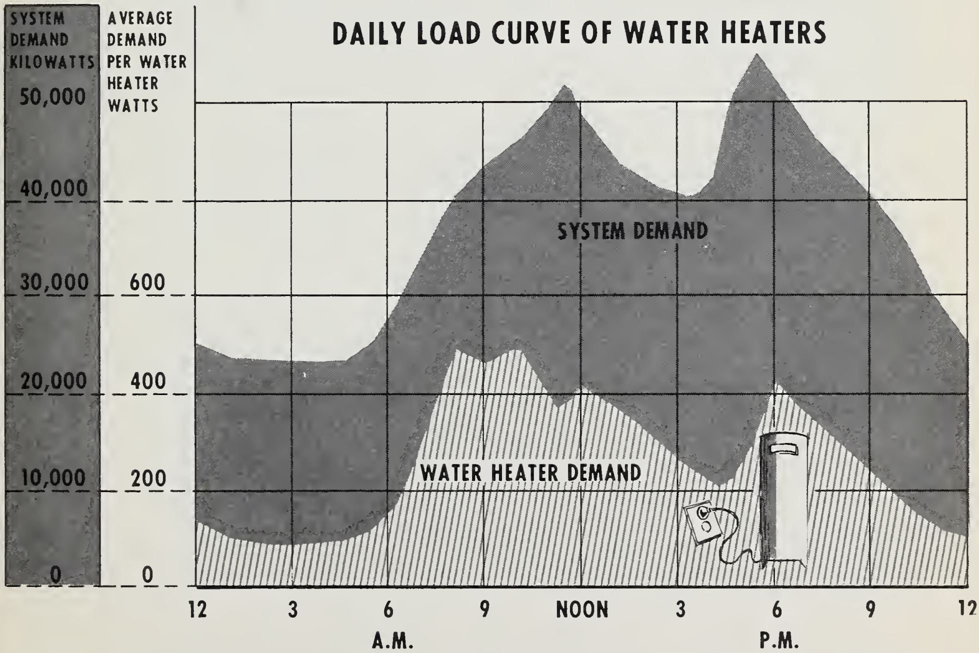
History of REA System Load Factors

In the early days of REA, some in the industry warned that farm lines had a very poor load factor and for this reason it would be difficult for REA loans to pay out. They said borrowers should expect monthly system load factors of no more than 25 or 30 percent. During the first few years of REA experience, this turned out to be fairly close to the truth. The principal load was lighting and there was very little other load. REA systems initially had a sharp evening peak and very little daytime load.

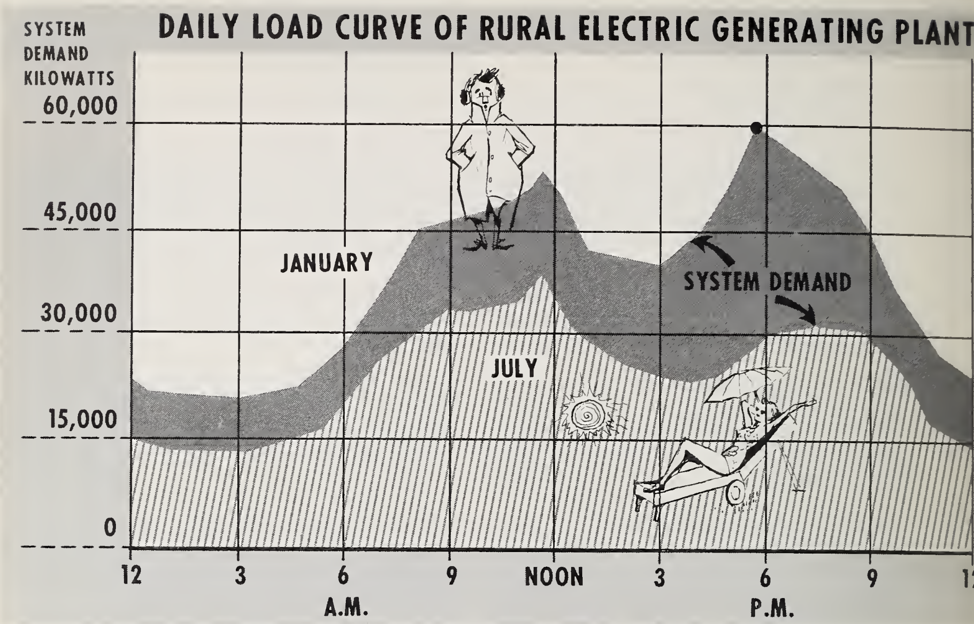
However, it was not long before daytime load commenced to grow. Electric refrigerators rapidly became popular; much of the early improvement in load factor is attributable to household refrigeration. Refrigerators added a steady load day and night—twelve months a year. From the standpoint of the electric supplier there is hardly any more desirable load. Its *diversified annual load factor is at least 80 percent.

Somewhat later electric water heaters began to improve system load factors. Their kilowatt-hour usage is large and the demand of the standard storage type heater is small, in comparison. Some cooperatives installed off-peak control of heaters for further improvement. Water heating is a year round load but drops off the late evening hours. Its diversified annual load factor is about 60 percent. Typical REA systems have now achieved electric water heater saturations ranging from 20 percent to 50 percent. A few exceed 60 percent saturation.

** The combined load factor of a large group of refrigerators— at no time will all of their motors be in operation simultaneously.*



Diversified Demand per Heater of Water Heaters in Ten Farm Homes. No Off Peak Controls Were Used. Heaters Added 400 Watts per Heater to System Peak.



System Peak Occurs Near 6 p.m. in Winter and Near Noon in Summer.

Because of appliances in the home and on the farm, as well as commercial and industrial loads, the monthly load factors of typical REA systems have today risen to between 50 and 60 percent. A few are in excess of 60 percent.

Annual system load factors are necessarily somewhat below the monthly load factors because of seasonal variation of load. The annual load factors of typical REA systems range from about 42 percent to about 54 percent. There are notable exceptions. Systems which have a very heavy irrigation load usually have a much lower annual load factor; systems which have a heavy oil pumping load usually have a somewhat higher annual load factor.

History of REA Load Curves

As load factors improved, the shape of the daily load curves of REA systems also changed. In addition to the evening peak, a morning peak was created by the use of electric appliances. Electric ranges added their contribution, creating a peak at the time of preparation of the mid-day meal. Today many REA systems have a forenoon peak approximately equal to the evening peak. Often, the morning peak predominates in summer and the evening peak predominates in winter.

In the South there has been a rapid increase during recent years in air conditioning. This plus fan load, refrigeration, and various seasonal farm usages have created summer system peaks considerably in excess of winter peaks. In the North, however, winter peaks continue to exceed summer peaks.

In the West irrigation has had a tremendous effect on system load curves and load factor of many REA systems. Irrigation tends to create large summer peaks. There

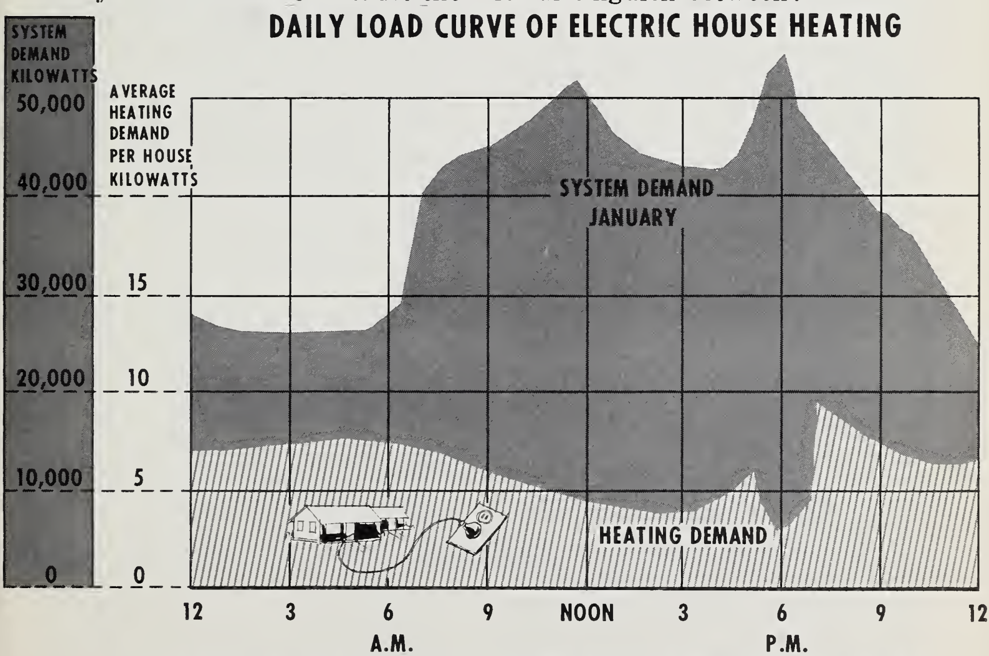
are several systems whose summer peaks are 5 to 10 times their winter peaks. Although the monthly load factor is high in summer and may also be high in winter, the annual load factor in such cases is low. System capacity must, of course, be adequate to carry the summer peak.

Selective Power Use Promotion

It is evident that load curves are still undergoing continual change. It is, therefore, important for management to make periodic surveys of the trends. One reason for doing so is to forecast future system load. Another is to influence the trends by sales promotion efforts to improve load factor. For example, electric house heating offers splendid opportunities to some systems for balancing summer load with winter load. The purpose at all times should be to "fill in the valleys" in the load curve. At the same time, it is important to foresee that a "filled-in valley" may some day be changed into a peak. Therefore, the sales emphasis may shift from year to year, from promotion of summer load to promotion of winter load, or from the promotion of load at one time of day to another time of day. The only period which has remained off peak on all systems over the years is the nightly period from 10 p.m. to 6 a.m. Even this valley may some day be filled, although there are as yet no grounds for predicting it.

Studies of Load Characteristics

Load characteristics and load curves of the principal appliances and other electric equipment have been studied by electric utilities and the results published in readily available periodicals. These studies distinguish between:



Diversified Heating Demand of 8 Homes With Off Peak Control. Heating Demand at Time of System Peak Was Reduced by "Half Voltage Control."

1. Non-diversified load factor of one individual appliance.

2. Diversified load factor of a large group of similar appliances.

3. Load factor of a single residence.

4. Diversified class load factor. For example: the combined load factor of the residential consumer class as a whole.

5. System load factor.

Such studies are concerned with annual load factor, but also deal with daily and monthly load factor.

In order to determine the effect of a given appliance the diversified load curve of the appliance is superimposed on the system load curve. (See the illustrations in this article.) It then becomes evident to what extent the load created by the appliance will fill in valleys or add to peaks.

Future Load Factors

There have been indications in the last few years that the upward trend of load factors may have ceased for systems with high load factors. A tendency to stabilize has appeared. Future trends are uncertain and could turn downward.

It seems likely that there will be a continued increase in electric air conditioning and space heating. Monthly residential load factors are often improved by air conditioning in summer and by space heating in winter. Annual residential load factors, on the other hand, are likely to be reduced. Some utility systems have already experienced reductions. The effect on annual *system* load factor will vary greatly from system to system, depending on non-residential loads and on the system load curve.

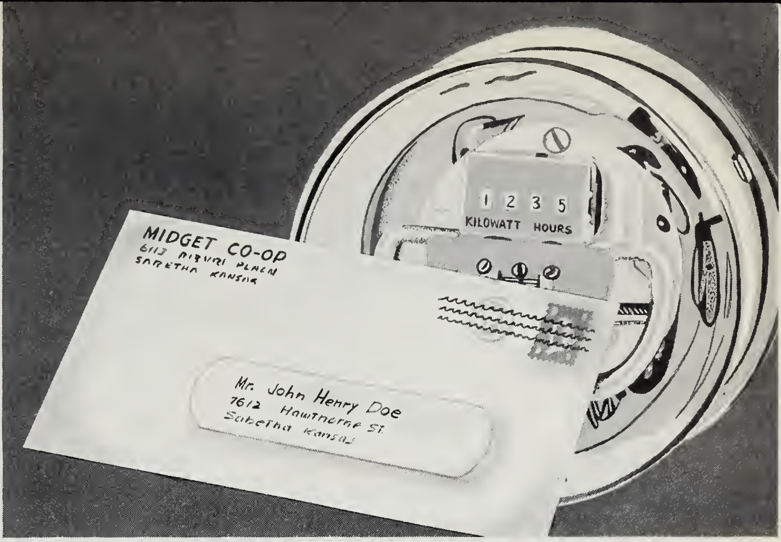
Large increases in seasonal farm loads also seem likely in the near future, notably irrigation. Most farm operations are seasonal. Some increases in year-round high load factor farm loads are also in prospect, but not in amounts as large as seasonal and intermittent loads. It would therefore appear that future annual system load factors on rural electric systems will largely depend on the manner in which the various prospective seasonal loads combine. If this is so, it will become more important in the future than in the past to know the load characteristics of farm and residential equipment and to use that knowledge to improve system load factor.

System capacity must be adequate to carry annual peak loads. Therefore, system planning engineers think mainly in terms of annual load factor. High annual load factor involves continuous use of system facilities and this reduces the investment expense per kwh sold to the consumer.

Cost of purchased power is normally based on maximum monthly demand and monthly kilowatt-hour usage. Therefore, high monthly load factor reduces power cost per kilowatt-hour.

It follows that power sales planning will best obtain the benefits of high load factor, by promoting appliances which will improve monthly load factor as well as those which will improve annual load factor. The load curves of electric appliances and equipment can be used to select those which will improve monthly and annual load factors by filling valleys and avoiding peaks. This will result in maximum use of system facilities and minimum expense per kilowatt-hour.

What is This *Zero* Billing?



by Frank Wilkinson, Head Management Section, EOL

Here it is only 3 o'clock, thought Mary Doe, billing clerk of the Middleville Electric Cooperative, and half the month's bills are posted already. Six months ago, it would have taken her longer and she would have been much more exhausted. The meter book in front of her said Andrew Moore's meter reading was 978 kwh this month. Last month it was 750. Subtracting 750 from 970 gave an answer of 220. She remembered that the billing for 220 kwh was $8.87. A quick glance at the card on her billing machine confirmed this, and Andrew Moore's bill was posted. Seldom had she thought of quitting her job, thought Mary Doe with a smile, since the co-op had adopted zero billing.

Zero billing is the term applied to the billing procedure under which the last digit of the meter reading is always changed to zero before the kwh consumption is determined.

It is a method in common usage and has a number of procedural advantages. Zero billing saves time and money in preparation of bills, and makes for greater accuracy in computing consumer bills.

As in most other billing procedures, clerks who work with zero billing use charts for various rate schedules. A total of only 160 figures are used to compute bills for a schedule ranging from minimum bill users to 1,300 kwh per month users; on an individual kwh basis this would require approximately 2,500 individual figures. With this small number of figures, many billing clerks soon memorize all of them, which greatly expedites their work.

The zero billing charts can be prepared either in a large type on forms suitable for wall hanging or typewritten on forms suitable for attaching to a wall bracket directly over the billing machine carriage. This choice is usually left to the preference of the individual machine operator.

In the case of wall charts they should be printed on "eye-easy green" colored backgrounds rather than the typical glossy white. The distance of the operator from the

Margery Klinger holds small zero billing chart. On the wall is complicated old-style chart.

chart should be individually adjusted.

Most operators prefer the smaller chart. Figures on this chart are of a size similar to those on the ledger sheets and a bracket holds it above the machine carriage at a convenient eye-level. Obviously, this arrangement greatly reduces the fatigue from eye strain. It eliminates the need for continually focusing and refocusing for the distances involved with wall charts.

The only objection sometimes voiced to zero billing is the necessity for the cooperative to absorb the lag in the payment for kwh consumed by each consumer which amounts to an average of about 4½ kwh per consumer. This average 4½ kwh per consumer is always picked up in payment when the bill is rendered for final meter readings. Of course, the final bill is computed on the exact kwh shown in the meter.

If properly installed and used, the zero billing procedure cannot result in a loss of revenue to the cooperative. Savings affected through its use are usually substantial.

When should it be used?

Zero billing is of greatest benefit on systems where the cooperative computes the bill and mails it to the consumer. Zero billing is of relatively limited value in cases where the consumer reads his own meter, determines the kwh consumption, uses a rate-chart to determine the amount due, and mails this information together with a check payable to the cooperative. Where some form of central service contract billing is used, there appears to be little need for zero billing.

How do you change from the typical method of meter reading?

You have to prepare the consumer, and the cooperative employees responsible for reading meters and computing the consumers bill, by giving them a thorough understanding of the purpose underlying the change and of the method required to change from the present way of reading the meter.

Where consumers read their own meters, newsletters and personalized notification to each consumer can be used to accomplish this objective.

A co-op should take two billing periods to complete the change. This allows the cooperative to absorb the lag in payment for kwh used. This lag amounts to an average of 4½ kwh per consumer and will be picked up when the consumer disconnects and a final bill is computed based on the exact final kwh readings shown on the meter. In each of the two months, change only the current month's meter reading.

Michigan Manager Killed On Job

The ice storm which swept southern Michigan in January led Howard E. Alverson to sudden death. Alverson, manager of the Southeastern Michigan Rural Electric Cooperative, at Adrian, was electrocuted while trying to restore service to the homes of about 50 members of the co-op.

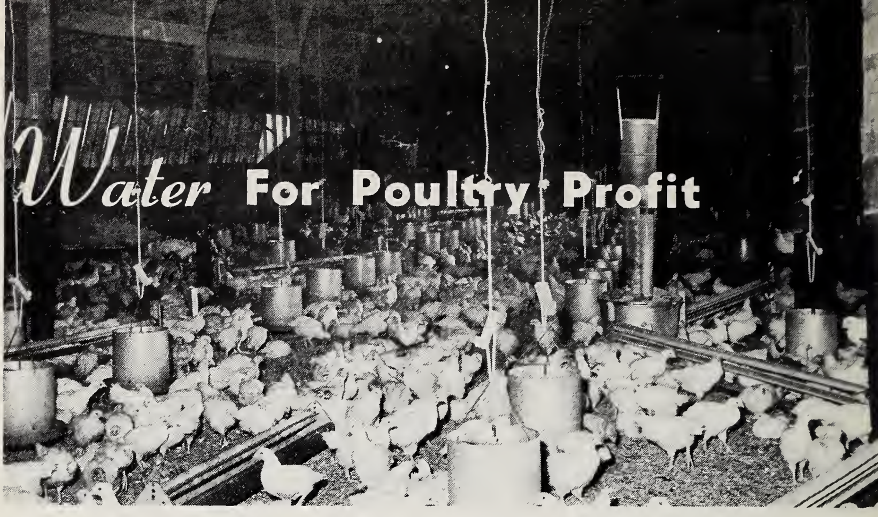
On the morning of January 20, the lines of the Southeastern Michigan co-op were a shambles. The storm had taken down poles and snapped lines. About 85 percent of the co-op's 2,100 members were out of service.

Ordinarily, linemen from adjoining co-ops would have moved in to restore service immediately, since emergency service is a cooperative venture in that region. On this morning it was impossible. The storm damage covered most of Ohio and Michigan and all nearby co-ops had the same urgent problem of restoring their own service.

Alverson, at the moment of the tragedy, was working with a member of the co-op who had volunteered to help out. The line superintendent had been dispatched to another area. Alverson, a former lineman and line superintendent himself, climbed a three-phase pole to make a splice. While standing on an icy transformer box, he apparently slipped, and touched a 7200-volt hot wire. It is thought he may have believed all three phases were dead.

The 47-year-old manager leaves a wife and three daughters. He had spent all his life in the vicinity of Adrian, except for wartime service aboard Navy destroyers. He began his career with the Southeast Michigan co-op as a lineman, and advanced through the post of line superintendent to the position of manager.

The zeal with which he was attempting to restore service on January 20 was typical of his career. It was a fitting tribute to him that his line crews, with the help of crews from five Michigan and five Ohio co-ops, kept right on with their work. Before the week was over, complete service had been restored to all members on the stricken 500-mile system.



Water For Poultry Profit

It takes water, and lots of it, to produce eggs. More than half of a hen's body and over two-thirds of an egg are water. Water is needed for all a hen's body activities. When properly warmed in winter, water helps keep up egg production even in sub-zero weather.

One thousand laying hens will require 50 gallons per day, including evaporation and the usual spillage. One thousand broilers, at 12 weeks, need 40 gallons daily. At 12 weeks maturity, the broilers will have required a total of 5,600 gallons of water.

Research experiments have shown that a shortage of water, even for as short a time as 24 hours, will cause a drop in egg production more quickly than will a shortage of feed.

R. L. Gravatt and sons, who operate a poultry and cattle farm near Bowling Green, Virginia, know that plentiful quantities of water plus constant availability can mean the difference between profit and disaster.

Electric power for the 35-acre Gravatt farm is supplied by the REA borrower in Bowling Green, the Virginia Electric Cooperative.

In two modern cinder-block poultry houses, built end-to-end, Gravatt and his two sons maintain a flock of 1,800 laying hens, turn out 10,000 broilers at a time four times a year, and produce about 600 dozen eggs a week.

Yes, it's a tremendous job, but electric power makes it easier.

Heart of the watering operation is the shallow well jet pump in the basement of the Gravatt house. From this central point, Gravatt has run more than 160 yards of ¾ inch plastic pipe, underground, to the broiler house and laying house.

Here, the pipe fans out in several directions, to feed about a doz-

Plenty of clean water, at correct temperature, keeps Gravatt broilers fat, results in better price at market-time.

en water hydrants that, in turn, supply about forty automatic watering fountains for the hens. All the exposed pipe in the hen-house is spiralled with plastic electric heating tape to prevent the pipes from freezing. The tape is also used on the watering fountains.

Spaced throughout the broiler house are about a dozen low-slung electric brooders, each furnished with half a dozen heat lamps.

Gravatt has devised an ingenious system for "doctoring" his flock. The hens need a certain amount of liquid medication at intervals throughout the week. Instead of taking the medicine to each trough—a chore that is too time-consuming — Gravatt has rigged up a 55-gallon steel drum and filled it with medication. By means of a series of shut-off valves, he can turn the water off in any section of the house, and run the medication through the pipes instead. When the flock gets enough "vitamins", Gravatt turns off the medicine and turns on the water.

To the rear of the laying house is the big egg-handling room. Here, the daily production of eggs is candled, graded for size and washed, all electrically. Storage is provided by a huge walk-in cooler that can take care of up to 1,000 dozen eggs at a time. This room is thoroughly insulated and is kept at safe temperatures by a ½-horsepower cooling unit.

Layers gather round the water fountain on Gravatt farm. Production is more than 1,000 eggs a day.

The Gravatts also maintain a small herd of milk cattle. Automatic watering troughs, here too, play an important role in saving labor, at low cost.

Six 250-watt heat lamps in this electric chick brooder keeps flock warm in cold weather.

The elder Gravatt cocked a quizzical eye at his extensive "chicken empire."

"Couldn't even hope to do a job this big," he admitted, "without lots of running water, and lots of electricity to keep it running."

Mr. Gravatt operates electric egg candler and grader. Electric egg washer (foreground) cleans eggs automatically with special detergent.

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